Journal of Chemical and Engineering Data 2015 vol.60 N3, pages 748-761

Enthalpies of vaporization and sublimation of the halogen-substituted aromatic hydrocarbons at 298.15 k: Application of solution calorimetry approach

Solomonov B., Varfolomeev M., Nagrimanov R., Novikov V., Ziganshin M., Gerasimov A., Verevkin S.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2015 American Chemical Society. Recently, the solution calorimetry has been shown to be a valuable tool for the indirect determination of vaporization or sublimation enthalpies of low volatile organic compounds. In this work we studied 16 halogen-substituted derivatives of benzene, naphthalene, biphenyl, and anthracene using a new solution calorimetry based approach. Enthalpies of solution at infinite dilution in benzene as well as molar refractions for the chlorine-, bromine-, and iodine-substituted aromatics were measured at 298.15 K. Vaporization and sublimation enthalpies of these compounds at 298.15 K were indirectly derived from the solution calorimetry data. In order to verify results obtained by using solution calorimetry, vaporization/sublimation enthalpies for 1,2-, 1,3-, 1,4-dibromobenzenes, 4-bromobiphenyl, and 4,4′-dibromobiphenyl were additionally measured by using the well established transpiration method. Experimental data available in the literature were collected and evaluated in this work for the sake of comparison with our own results. Vaporization and sublimation enthalpies of halogen-substituted aromatics under study derived by using solution calorimetry approach have been in a good agreement with those measured by conventional methods. This fact approves using of solution calorimetry for determination or validation of sublimation/vaporization enthalpies for different aromatic compounds at reference temperature 298.15 K, where the conventional experimental data are absent or in disarray. Evaluated in this work a data set has been used to establish a simple group additivity scheme for prediction of vaporization enthalpies for halogen-substituted aromatic hydrocarbons.

http://dx.doi.org/10.1021/je5008795